

(19) World Intellectual Property Organization
International Bureau(43) International Publication Date
9 August 2007 (09.08.2007)

PCT

(10) International Publication Number
WO 2007/090017 A1

(51) International Patent Classification:

A61F 2/44 (2006.01)

(21) International Application Number:

PCT/US2007/060980

(22) International Filing Date: 24 January 2007 (24.01.2007)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

11/340,972

27 January 2006 (27.01.2006)

US

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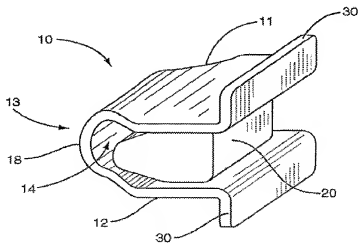
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Parkway MSLC340, Minneapolis, Minnesota 55432 (US).(81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN,
CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI,
GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS,
JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS,
LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MY,
MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS,
RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN,
TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.(84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, GH,
GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM,
ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),
European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI,
FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT,
RO, SI, SK, SL, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA,
GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report

— before the expiration of the time limit for amending the
claims and to be republished in the event of receipt of
amendmentsFor two-letter codes and other abbreviations, refer to the "Guid-
ance Notes on Codes and Abbreviations" appearing at the begin-
ning of each regular issue of the PCT Gazette.

(54) Title: INTERVERTEBRAL IMPLANTS AND METHODS OF USE



(57) Abstract: Implants and methods for spacing and stabilizing vertebral members. The implant in one embodiment may include first and second endplates (11, 12) and an intermediate section (13) that form an interior section (14). An elastic member (20) may be positioned within the interior section to space apart the endplates. The elastic member may have a variety of orientations, sizes, shapes, densities, modulus of elasticity, and other material properties depending upon the desired displacement between the first and second endplates. In use according to one embodiment, the implant may assume a first shape when the vertebral members are aligned, such as when the patient is standing erect or in a prone position. This first shape may include the first and second endplates spaced a first distance apart. During movement of the vertebral members, the endplates may be forced together. The intermediate section in combination with the elastic member may be deformed during this movement and thereby exert a force to stabilize the vertebral members.

INTERVERTEBRAL IMPLANTS AND METHODS OF USE

Background

The present application is directed to devices and methods for stabilizing vertebral members, and more particularly, to intervertebral implants and methods of use for replacing an intervertebral disc, vertebral member, or combination of both to distract and/or stabilize the spine.

The spine is divided into four regions comprising the cervical, thoracic, lumbar, and sacrococcygeal regions. The cervical region includes the top seven vertebral members identified as C1-C7. The thoracic region includes the next twelve vertebral members identified as T1-T12. The lumbar region includes five vertebral members L1-L5. The sacrococcygeal region includes nine fused vertebral members that form the sacrum and the coccyx. The vertebral members of the spine are aligned in a curved configuration that includes a cervical curve, thoracic curve, and lumbosacral curve. Intervertebral discs are positioned between the vertebral members and permit flexion, extension, lateral bending, and rotation.

Various conditions may lead to damage of the intervertebral discs and/or the vertebral members. The damage may result from a variety of causes including a specific event such as trauma, a degenerative condition, a tumor, or infection. Damage to the intervertebral discs and vertebral members can lead to pain, neurological deficit, and/or loss of motion.

Various procedures include replacing the entirety or a section of a vertebral member, the entirety or a section of an intervertebral disc, or both. One or more replacement implants may be inserted to replace the damaged vertebral members and/or discs. The implants reduce or eliminate the pain and neurological deficit, and increase the range of motion.

Summary

The present application is directed to implants and methods for spacing and stabilizing vertebral members. The implant may include first and second endplates and an intermediate section that form an interior section. An elastic member may be positioned within the interior section to space apart the endplates. The elastic member may have a variety of orientations, sizes, shapes, densities, modulus of elasticity, and other material properties depending upon the desired displacement between the first and second endplates.

In use according to one embodiment, the implant may assume a first shape when the vertebral members are aligned, such as when the patient is standing erect or in a prone position. This first shape may include the first and second endplates spaced a first distance apart. During movement of the vertebral members, the endplates may be forced together or apart. The intermediate section in combination with the elastic member may be deformed during this movement and thereby exert a force to stabilize the vertebral members.

Brief Description of the Drawings

Figure 1 is a perspective view of an implant according to one embodiment.

Figure 2 is a cross-sectional view of an implant positioned between vertebral members according to one embodiment.

Figure 3 is a cross-sectional view of an implant positioned between vertebral members that are in flexion according to one embodiment.

Figure 4 is a perspective view of a body having upper and lower endplates and an intermediate section according to one embodiment.

Figure 5 is a side schematic view of a body according to one embodiment.

Figures 6A-F are side schematic views of embodiments of a body with an intermediate section.

Figure 7 is a side schematic view of a body according to one embodiment.

Figures 8A-8H are cross-sectional top views of embodiments of an elastic member positioned relative to an endplate.

Figures 9A-9D are side schematic views of embodiments of elastic members positioned within a body.

Figure 10 is a cross-sectional view of an elastic member according to one embodiment. Figure 11 is a cross-sectional view of an elastic member according to one embodiment. Figure 12 is a schematic side view of a limiter according to one embodiment. Figures 13A-13B are side schematic views of a limiter according to one embodiment. Figures 14A-C are views of an implant according to one embodiment. Figure 15 is a cross-sectional top view of devices positioned relative to a vertebral member according to one embodiment.

Detailed Description

The present application is directed to implants and methods for replacing an intervertebral disc, vertebral member, or combination of both. The implant includes a body sized to replace the removed elements. The body may include first and second endplates and an intermediate section that together form an interior section. An elastic member is positioned within the interior section. The elastic member may have a variety of orientations, sizes, shapes, densities, modulus of elasticity, and other material properties depending upon the desired displacement between the first and second endplates. The endplates may be spaced apart a first distance when the vertebral members are aligned. During movement of the vertebral members, the endplates may be forced together or apart. The intermediate section in combination with the elastic member may be deformed during this movement and thereby exert a force that prevents or reduces the movement of the endplates.

Figure 1 illustrates one embodiment of an implant having a body 10. Body 10 includes an upper endplate 11, lower endplate 12, and an intermediate section 13. Intermediate section 13 spaces apart the endplates 11, 12 forming an interior section 14. An elastic member 20 is positioned within the interior section 14. Tabs 30 may extend from the body 10 and provide a means for positioning the body 10 relative to the vertebral members 100.

Figure 2 illustrates a cross-sectional view of the implant of Figure 1 positioned within the patient. The implant is in a first position with the vertebral members 100 being substantially aligned. The upper and lower endplates 11, 12 are in contact with vertebral members 100. Intermediate section 13 is positioned within the space formed between the vertebral members 100. In this embodiment, intermediate section 13 is positioned in a

posterior direction in proximity with a posterior edge 102 of the vertebral members and away from an anterior edge 101. Elastic member 20 is positioned within the interior section 14. Tabs 30 extend into the vertebral members 100 to position the implant.

Figure 3 illustrates the implant with the vertebral members 100 in flexion. The movement of the vertebral members 100 causes the endplates 11, 12 to move inward towards one another and elastically deform the elastic member 20 and the intermediate section 13. The intermediate section 13 and the elastic member 20 resist the flexion and apply an outward force on the vertebral members 100. The amount of force applied to the vertebral members 100 may vary as described below in detail. Both the intermediate section 13 and elastic member 20 may be constructed of elastic, resilient materials that return towards their original shape upon realignment of the vertebral members 100.

In one embodiment, the intermediate section 13 and the elastic member 20 are flexible to provide dynamic stabilization while maintaining certain biomechanical motions of the spine. Stabilization may be maintained during motions such as flexion, extension, lateral bending, and rotation. The intermediate section 13 and elastic member 20 are constructed to have a predetermined stiffness to provide the stabilization. Further, the stiffness may vary during a biomechanical motion.

Body 10 comprises the upper and lower endplates 11, 12 and the intermediate section 13. In one embodiment such as illustrated in Figure 1, the body 10 is constructed of a single member having a folded configuration. In other embodiment, body 10 is constructed of two or more different members. Figure 5 illustrates one embodiment with the intermediate section 13 constructed of a separate piece that is attached to the endplates 11, 12. Upper endplate 11 is attached to the member 18 with one or more fasteners 16.

Embodiments of fasteners 16 may include rivets, pins, screws, etc. Lower endplate 12 is attached to the member 18 in another manner, such as with adhesives, welding, brazing, etc. Figure 7 illustrates another embodiment with the intermediate section 13 constructed of two separate members 18a, 18b. In this embodiment, first member 18a is integral with endplate 11, and second member 18b is integral with endplate 12. Members 18a, 18b are connected together in a manner as described above. Body 10 may be constructed of a variety of materials including metals, polymers, ceramics, and combinations thereof. Examples of metals include titanium, titanium alloys such as nickel-titanium, stainless steel, and cobalt chromium. Examples of polymers include

PEEK, PEEK-carbon composites, polyimide, polyetherimide, and polyurethane. Examples of ceramics include calcium phosphate, hydroxyapatite, HAPCP, alumina, and zirconium.

Endplates 11, 12 are shaped to contact the vertebral members 100. Endplates 11, 12 may be shaped to adapt accurately to the shape of the plates of the vertebral members 100. The shape and size of the endplates 11, 12 may vary, as well as the size of the surface area that contacts the vertebral members 100. One embodiment illustrated in Figures 14A-C includes convex endplates 11, 12. The upper and lower endplates 11, 12 may have the same shape and size, or may have different shapes or sizes. By way of example, the embodiment of Figure 1 includes endplates 11, 12 having substantially the same shape and size. In other embodiments, endplates 11, 12 may have different shapes and sizes. Examples of shapes for the endplates 11, 12 include round, oval, elliptical, kidney shaped, square, rectangular, trapezoidal, and boomerang shape, etc.

One embodiment illustrated in Figure 4 includes the upper endplate 11 with a split configuration having first and second fingers 11a, 11b, with the lower endplate 12 formed as a single section and having an opening 15. In one embodiment, the space formed between the fingers 11a, 11b and the opening 15 are aligned. In one embodiment, endplates 11, 12 have a planar construction as illustrated in the embodiments of Figure 4, 6A, and 6B. In another embodiment, endplates 11, 12 have a curved construction as illustrated in the embodiments of Figures 6C, and 6F. In yet other embodiments, endplates 11, 12 have a combination of curved and planar sections as illustrated in the embodiment of Figure 6D.

Endplates 11, 12 may be positioned at a variety of relative angular positions when no external forces are applied to the implant. In one embodiment, endplates 11, 12 are substantially parallel. In another embodiment, the endplates 11, 12 angle outward from the intermediate section 13 such that a height of the interior section 13 is less near the intermediate section 13 and increases towards the ends of the endplates 11, 12. In another embodiment, endplates 11, 12 angle inward as they extend from the intermediate section 13.

Intermediate section 13 extends between the endplates 11, 12 and provides resistance to movement of the endplates 11, 12. Intermediate section 13 may have a variety of shapes. In one embodiment as illustrated in Figure 5, intermediate section 13

has substantially planar upper and lower sections. In other embodiments, intermediate section 13 has a curved shape. In various other embodiments, intermediate section 13 has a combination of planar and curved shapes. The width of the intermediate section 13 may be substantially the same or different as one or both endplates 11, 12. In one embodiment illustrated in Figures 14A-C, the width of the intermediate section 13 is less than the endplates 11, 12. The narrower width may be centered along a centerline of the body 10, or may be off-center. The thickness of the intermediate section 13 may be the same or different as one or both endplates 11, 12. In one embodiment, intermediate section 13 comprises two separate spaced-apart sections as illustrated in Figure 8H.

In some embodiments, intermediate section 13 is constructed from a single member 18. Figure 6A illustrates one embodiment with the intermediate section 13 having a curved shape with an overlapping configuration between the endplates 11, 12. Figure 6B illustrates an embodiment having an intermediate section 13 with an overlapping configuration and comprised of planar and curved sections. Figure 6C illustrates an embodiment having multiple overlapping sections. Figure 6D illustrates an embodiment with an intermediate section 13 having an enclosed section 17 positioned between sections of member 18.

Embodiments of the intermediate section 13 may include multiple members 18. Figure 6E illustrates an embodiment with a curved first support section 18a and a second support section 18b. Figure 6F illustrates another embodiment of an intermediate section 13 comprising sections 18a, 18b, and 18c. Section 18a extends from the endplates 11, 12. Sections 18b, 18c form a criss-cross pattern. In embodiments having multiple members 18, members 18 may be constructed in a unitary fashion, or from multiple different members fastened together. Members 18 may extend along the entire width of the endplates 11, 12, or a limited section or sections of the width. In the embodiment of Figure 4, the endplate 18 extends along substantially the entire width. In the embodiment of Figure 14C, the member 18 extends along a limited width of the endplates 11, 12.

Further, the body may include multiple members 18 as illustrated in the embodiments of Figures 8F and 8H. In embodiments with multiple members 18, the members may have the same construction, or may have different constructions.

Elastic member 20 is positioned within the interior space 14 and has a stiffness to provide resistance and prevent movement of the endplates 11, 12. The elastic member 20

shares the load applied to the implant and may prevent fatigue failure of the intermediate section 13. The elastic member 20 may impose a substantially linear or non-linear resistance to prevent movement of the endplates 11, 12.

Elastic member 20 may be constructed of a variety of different materials. Member 20 may be resilient and change shape during movement of the endplates 11, 12. Examples of such materials include elastic or rubbery polymers, hydrogels or other hydrophilic polymers, or composites thereof. Particularly suitable elastomers include silicone, polyurethane, copolymers of silicone and polyurethane, polyolefins, such as polyisobutylene and polyisoprene, neoprene, nitrile, vulcanized rubber and combinations thereof. Examples of polyurethanes include thermoplastic polyurethanes, aliphatic polyurethanes, segmented polyurethanes, hydrophilic polyurethanes, polyether-urethane, polycarbonate-urethane and silicone polyetherurethane. Other suitable hydrophilic polymers include polyvinyl alcohol hydrogel, polyacrylamide hydrogel, polyacrylic hydrogel, poly(N-vinyl-2-pyrrolidone hydrogel, polyhydroxyethyl methacrylate hydrogel, and naturally occurring materials such as collagen and polysaccharides, such as hyaluronic acid and cross-linked carboxyl-containing polysaccharides, and combinations thereof. Elastic member 20 may be connected to the body 10, or may be freely positioned within the interior section 14. In one embodiment, elastic member 20 is connected to one or more of the endplates 11, 12 and intermediate section 13. The elastic member 20 may be connected with mechanical fasteners such as screws, pins, rivets, etc. In another embodiment, elastic member 20 is connected to the body 10 with an adhesive. In one embodiment, the inner edges of one or more of the endplates 11, 12 and intermediate section 13 include a roughened surface, ridges, teeth, etc. to maintain the position of the elastic member 20. In one embodiment, the elastic member 20 is shaped to connected with one or both endplates 11, 12. In a specific embodiment, the elastic member 20 has a dovetailed recess that mounts to an extension that extends from the endplate.

When connected to both endplates 11, 12, the elastic member 20 provides resistance to both inward and outward movement. During inward movement of the endplates 11, 12, elastic member 20 is compressed and provides a resistance to the inward movement. During outward movement of the endplates 11, 12, the elastic member 20 is placed in tension to provide resistance. In one embodiment, the elastic member 20 is

placed in compression during flexion of the vertebral members and placed in tension during extension.

In one embodiment with the elastic member 20 connected to only one endplate 11 or 12, or when positioned between the endplates 11, 12 and connected to neither, the elastic member 20 provides resistance to inward movement. The elastic member 20 may not be placed in tension during outward movement and the resistance to this movement is limited to the intermediate section 13.

Elastic member 20 may be spaced from or in contact with the intermediate section 13. Elastic member 20 may further have a variety of heights and widths. In various embodiments, elastic member 20 is constructed from a single member as illustrated in

Figures 8A-8E. Figure 8A illustrates one embodiment having an elastic member 20 with a substantially rectangular shape. Figure 8B illustrates a substantially C-shaped elastic member 20 with the base facing an anterior direction away from the support member 18 of the intermediate section 13. Figure 8C illustrates an elastic member 20 having a rectangular first surface that contacts the endplate 12 and four planar sidewalls that taper upwards. Figure 8D illustrates an embodiment having an irregular, non-symmetrical shape. Figure 8E illustrates an embodiment having a substantially C-shaped elastic member 20 with a base facing in a posterior direction towards the support member 18 of the intermediate section 13.

Elastic member 20 may further include two or more separate members. The separate members may have the same construction, or may be constructed of different materials having a different stiffness. Figure 8F illustrates an embodiment having three separate elastic members 20a, 20b, 20c. Each elastic member 20a, 20b, 20c is independent and positioned within the interior section 14 and has a substantially rectangular shape.

Figure 8G illustrates another embodiment having elastic members 20a, 20b, 20c each having a circular cross-sectional shape. Figure 8H illustrates an embodiment having a first elastic member 20a that is positioned within a second elastic member 20b. In one embodiment, elastic members 20a, 20b are connected together. In embodiments as illustrated in Figures 8G and 8H, elastic members 20 may have cylindrical, spherical, or conical shapes.

In a non-deformed state, the elastic member 20 may have a variety of heights H. In one embodiment, the height is sized for the member 20 to extend between and contact

both endplates 11, 12. In one embodiment, the height H may be substantially the same throughout the elastic member 20. In other embodiments as illustrated in Figures 9A and 9B, the height H may vary along the elastic member 20. In one embodiment, elastic member 20 has a first height H when the vertebral members are aligned. When placed in compression, the elastic member 20 has a smaller height. When placed in tension, the elastic member 20 stretches and has a greater height.

Figure 9A includes elastic member 20 having a height that decreases away from the intermediate section 13, and Figure 9B includes the elastic member 20 having a height that increases away from the intermediate section 13.

The implant may provide a variable resistance to deformation. The variable resistance may cause less resistance to initial amounts of vertebral movement, but apply greater forces to reduce larger vertebral movements. By way of example, the implant may be designed to provide little resistance during an initial amount of movement of the endplates 11, 12. Larger amounts of resistance may be applied to the vertebral members when the endplates 11, 12 move beyond the initial amount. In some embodiments, the stiffness of the elastic member 20 and intermediate section 13 increases with additional amounts of movement. The amount of resistance applied by one or both members may increase the further they move away from the original, first position.

Variable resistance may also result during compression from the height of the elastic member 20. In one embodiment, the height of the elastic member 20 is less than the height of the interior section (i.e., the member 20 does not contact both endplates 11, 12). The resistance to the initial inward movement of the endplates 11, 12 is isolated to the intermediate section 13. The elastic member 20 does not affect the stiffness until it is contacted by both endplates 11, 12 and begins to deform. In one embodiment, deformation is limited to the intermediate section 13 during an amount of initial endplate movement. Movement beyond this initial amount causes the endplates 11, 12 to begin deforming the elastic member 20 in addition to continued deformation of the intermediate section 13 resulting in greater stiffness of the implant and more resistance to additional movement.

The shape of the elastic member 20 may further cause variable resistance to deformation. Greater amounts of contact between the endplates 11, 12 and the elastic member 20 may result in greater amounts of resistance. By way of example using the

embodiments of Figures 9A and 9B, the peaked shapes of the elastic members 20 provides less resistance during initial amounts of inward movement of the endplates 11, 12. Additional inward movement of the endplates 11, 12 results in deformation of larger amounts of the elastic member 20 resulting in greater resistance.

Variable resistance may also be provided by multiple elastic elements. Figure 9C illustrates an embodiment having two separate elastic members 20a and 20b. During inward movement of the endplates 11, 12, the inner elastic member 20a is initially contacted thus causing a first amount of resistance. The second elastic member 20b is not contacted by the endplate 11 until the endplates 11, 12 are compressed beyond a predetermined amount. This compression then causes the elastic member 20b to deform resulting in additional amounts of resistance. In this embodiment, elastic members 20a, 20b may have the same or different stiffnesses.

Figure 9D illustrates an embodiment having a single elastic member 20 constructed of first and second materials 28a, 28b having a different stiffness. Initial compression of the endplates 11, 12 causes deformation of the first material 28a resulting in a first resistance. Additional compression causes deformation of the first and second materials 28a, 28b which together provide additional resistance.

In another embodiment (not illustrated), first and second members 20a, 20b are each attached to both endplates 11, 12. In this embodiment, the first member 20a has a greater height than the second member 20b. During initial outward movement of the endplates 11, 12, the second member 20b is placed in tension before the first member 20a. After a predetermined amount of outward movement, the first member 20a is also placed in tension thus increasing the overall resistance to movement of the endplates 11, 12. Elastic member 20 may fill varying amounts of the interior section 14. As illustrated in the embodiments of Figure 2, member 20 fills a limited amount of the interior section 14. In another embodiment as illustrated in Figures 10 and 11, elastic members 20 substantially fill the entirety of the interior section 14. In the embodiments of Figures 10 and 11, voids 21 are positioned within the elastic member 20. In one embodiment, voids have a specific shape and size to control the supporting abilities of the elastic member 20. Voids 21 may be substantially free of material, or may be filled with a material that is different than that of the elastic member 20. As illustrated in Figure 10, voids 21 may be

positioned within the interior of the elastic member 20, or may be positioned along one edge as illustrated in Figure 11.

In one embodiment, elastic member 20 is positioned completely within the interior section 14. In other embodiments, elastic member 20 is positioned within the interior section 14 and extends outward from one or more sides.

A limiter may prevent movement of the endplates 11, 12 beyond a predetermined amount. Figure 12 illustrates one embodiment having a rigid limiting member 75 positioned within the interior section 14. Inward movement of the endplates 11, 12 will cause deformation of the elastic member 20. At a predetermined amount of movement, a top edge of limiting member 75 contacts the endplate 11 and prevents further inward movement. Limiting member 75 may have a variety of different shapes and orientations.

In another embodiment, limiting member 75 is formed of a non-elastic member that is attached to both endplates 11, 12. The limiting member 75 is in a slackened condition during an initial orientation as a length of the member 75 is greater than the distance between the endplates 11, 12. After the endplates 11, 12 have moved outward a predetermined distance, the limiting member 75 is tightened and limits further outward movement.

Another limiting embodiment is illustrated in Figures 13A and 13B. Endplates 11, 12 are formed with ends 19 positioned opposite from the intermediate section 13. In a first position as illustrated in Figure 13A, ends 19 are spaced apart. This allows for inward movement of the endplates 11, 12 during vertebral movement. At a predetermined amount of inward movement, ends 19 contact together as illustrated in Figure 13B and further inward movement is prevented.

In one embodiment, a keel extends outward from one or both endplates 11, 12 to connect with the vertebral members 100. In one embodiment as illustrated in Figure 2, tabs 30 are positioned within the vertebral members 100. In another embodiment, tabs 30 are positioned along an outer edge of the vertebral members 100 with the interior section 14 and intermediate section 13 positioned between the vertebral members 100. Tabs 30 may include apertures for receiving fasteners to attach the implant to the vertebral members 100.

In one embodiment, one or both endplates 11, 12 are constructed to have increased contact with the vertebral members. In one embodiment, the endplates 11, 12 are

constructed of a porous material. In another embodiment, endplates 11, 12 are textured. In still other embodiments, endplates 11, 12 include spikes or serrations. In one embodiment, one or both endplates 11, 12 may be coated with osteo-conductive material. Embodiments of the material may include hydroxyapatite and BMP.

Vertebral movement may cause relative movement of the endplates 11, 12. The terms “inward movement”, “outward movement” and the like are used herein in a general sense to describe the general motion of the endplates 11, 12 that reduces or increases the distance between the endplates 11, 12. The endplates 11, 12 may move directly towards or away from one another during this movement, or there may be some lateral component to the movement. Further, the vertebral movement may cause movement of one or both of the endplates 11, 12.

The device can be placed within the intervertebral space by a variety of different approaches including anterior and lateral approaches. In one embodiment the device is inserted through a posterior approach.

In one embodiment, multiple devices are inserted within the intervertebral space as illustrated in Figure 15. In this embodiment, the devices may be placed bilaterally with the intervertebral space relative to the vertebral member 200.

In another embodiment, a single device is inserted for the correction of scoliosis. In this embodiment, the device may be placed on the concaved side of the spinal column to increase the disc height on the lower side.

In one embodiment, the elastic member 20 is positioned within the interior section 14 prior to placing the implant into the intervertebral space. In another embodiment, the body 10 is initially placed within the intervertebral space and then the elastic member 20 is positioned within the interior section 14.

As used herein, the terms “having”, “containing”, “including”, “comprising” and the like are open ended terms that indicate the presence of stated elements or features, but do not preclude additional elements or features. The articles “a”, “an” and “the” are intended to include the plural as well as the singular, unless the context clearly indicates otherwise.

Spatially relative terms such as “under”, “below”, “lower”, “over”, “upper”, “lower”, “intermediate”, and the like, are used for ease of description to explain the relative positioning of elements. These terms are intended to encompass different

orientations of the device in addition to different orientations than those depicted in the figures. Further, terms such as “first”, “second”, and the like, are also used to describe various elements, regions, sections, etc and are also not intended to be limiting. Like terms refer to like elements throughout the description.

The present invention may be carried out in other specific ways than those herein set forth without departing from the scope and essential characteristics of the invention. In one embodiment, the implant replaces all or a part of a disc. In another embodiment, implant replaces all or part of a disc and all or part of one or more vertebral members. Intermediate section 13 may have the same width as the endplates 11, 12, or may have different widths. Intermediate section 13 may also have the same or different thickness as the endplates 11, 12. The present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive, and all changes coming within the meaning and equivalency range of the appended claims are intended to be embraced therein.

Claims

What is claimed is:

1. An intervertebral device positioned between vertebral members, the device comprising:
an elongated member having an overlapping configuration with an intermediate section that spaces apart first and second endplates; and
an elastic member positioned between the first and second endplates and proximate to the intermediate section, the elastic member sized to space apart the first and second endplates during movement of the vertebral members.
2. The device of claim 1, wherein the first endplate has a different shape than the second endplate.
3. The device of claim 2, wherein the first endplate comprises first and second spaced-apart fingers.
4. The device of claim 1, wherein the intermediate section and the first and second endplates form a substantially C-shape.
5. The device of claim 1, wherein the intermediate section has an overlapping shape.
6. The device of claim 5, wherein the intermediate section comprises first and second support members.
7. The device of claim 1, wherein the elastic member is spaced away from the intermediate section.
8. The device of claim 1, further comprising a second elastic member positioned between the first and second endplates, the second elastic member being spaced away from the elastic member.
9. The device of claim 8, wherein the second elastic member has a different stiffness than the elastic member.

10. The device of claim 8, wherein the second elastic member has a different height than the elastic member.

11. The device of claim 1, further comprising a limiting member positioned between the first and second endplates, the limiting member being constructed to limit movement of the first and second endplates beyond a predetermined amount.

12. The device of claim 1, wherein the elastic member has a length measured between a first edge and a second edge, a height of the elastic member being variable along the length.

13. An intervertebral device positioned between vertebral members, the device comprising:

an elastic member;

a first endplate positioned above the elastic member and a second endplate positioned below the elastic member; and

an intermediate member positioned at ends of the first and second endplates and connecting together the first and second endplates, the intermediate member and the elastic member being configured to maintain the first and second endplates in a spaced apart configuration.

14. The device of claim 13, wherein the first and second endplates at least partially overlap.

15. The device of claim 13, wherein the first and second endplates and the intermediate member extend around three sides of the elastic member.

16. The device of claim 13, wherein the intermediate member has an overlapping configuration.

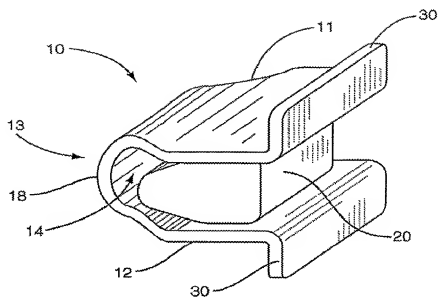
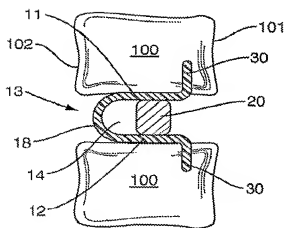
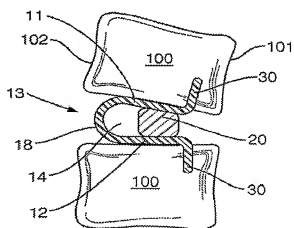
17. The device of claim 16, wherein a first section of the intermediate member is substantially planar and a second section of the intermediate member is substantially curved.
18. The device of claim 13, wherein the first endplate is connected to the intermediate section.
19. The device of claim 18, further comprising connecting means for connecting together the first endplate and the intermediate section.
20. The device of claim 13, wherein the first and second endplates and the intermediate section are constructed from a single, elongated member.
21. An intervertebral device positioned between vertebral members, the device comprising:
a flexible body having a width and positioned in an overlapping configuration to define a three-sided cavity; and
an elastic member positioned within the cavity and sized to space apart first and second sections of the flexible body.
22. The device of claim 21, wherein the flexible body includes an intermediate section having an overlapping configuration, the intermediate section spacing apart the first and second sections.
23. The device of claim 21, further comprising a second elastic member positioned within the cavity.
24. The device of claim 21, further comprising a limiter positioned within the cavity, the limiter being constructed to prevent first and second endplates of the flexible body from moving beyond a predetermined limit.

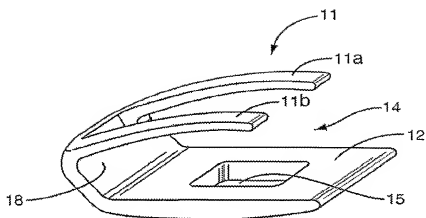
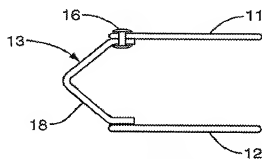
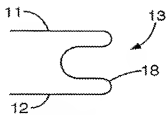
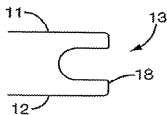
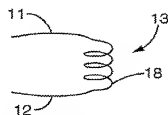
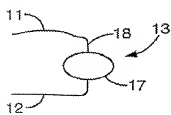
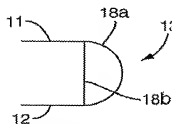
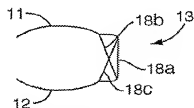
25. The device of claim 21, wherein a height of the elastic member varies along the length of the elastic member.
26. An intervertebral device positioned between vertebral members, the device comprising:
- an elastic member;
 - a first endplate positioned above the elastic member and a second endplate positioned below the elastic member; and
 - an intermediate member integral with the first and second endplates and positioned at ends of the first and second endplates, the intermediate member and the elastic member being deformable to apply a force to the first and second endplates during movement of the vertebral members.
27. The device of claim 26, wherein the elastic member extends outward beyond the first and second endplates.
28. The device of claim 26, further comprising a second elastic member positioned between the endplates, the second elastic member having a different stiffness than the elastic member.
29. The device of claim 26, wherein the elastic member has a variable height.

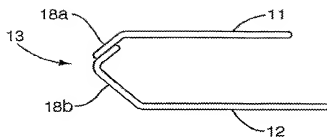
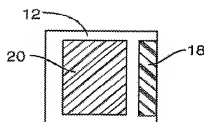
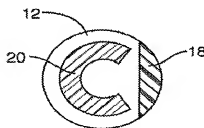
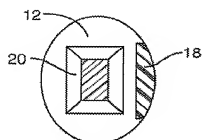
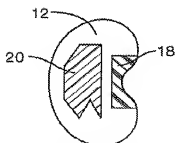
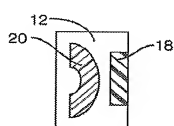
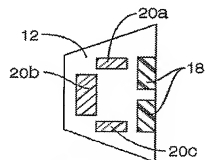
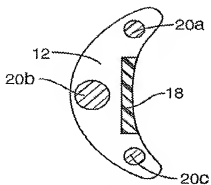
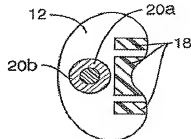
30. An intervertebral device positioned between vertebral members, the device comprising:

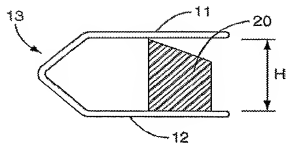
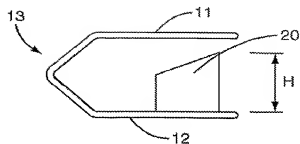
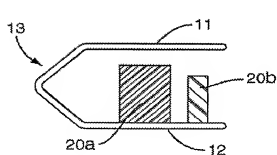
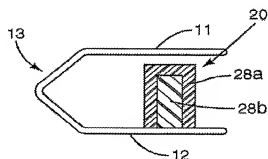
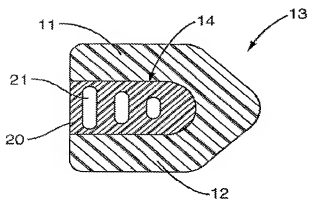
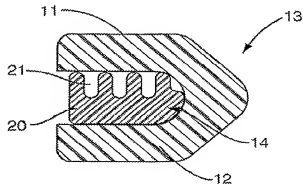
an elongated member having a folded orientation forming first and second endplates and an intermediate section;

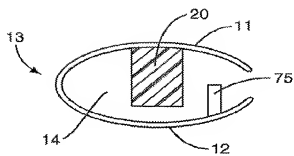
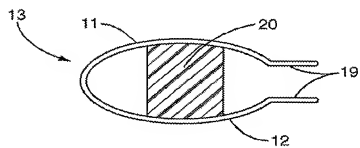
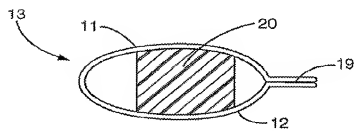
an elastic member positioned between the first and second endplates, the elastic member having a stiffness to apply an outward force to the first and second endplates when the first and second endplates move inward beyond a predetermined amount.

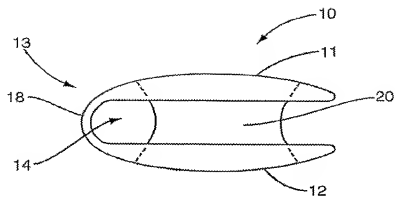
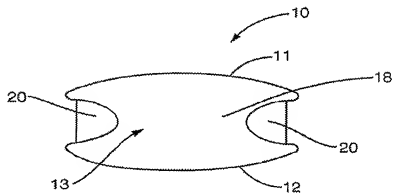
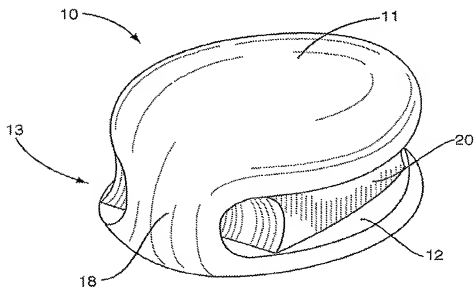
**FIG. 1****FIG. 2****FIG. 3**

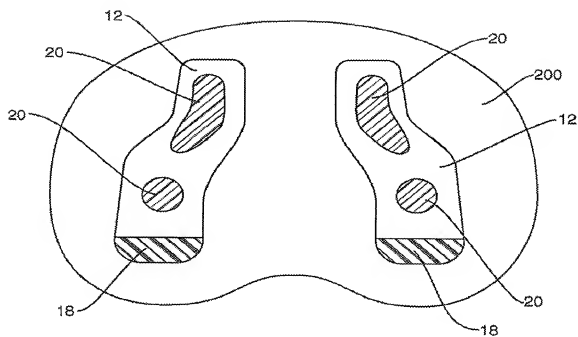
**FIG. 4****FIG. 5****FIG. 6A****FIG. 6B****FIG. 6C****FIG. 6D****FIG. 6E****FIG. 6F**

**FIG. 7****FIG. 8A****FIG. 8B****FIG. 8C****FIG. 8D****FIG. 8E****FIG. 8F****FIG. 8G****FIG. 8H**

**FIG. 9A****FIG. 9B****FIG. 9C****FIG. 9D****FIG. 10****FIG. 11**

**FIG. 12****FIG. 13A****FIG. 13B**

**FIG. 14A****FIG. 14B****FIG. 14C**

**FIG. 15**

International application No
PCT/US2007/060980

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A61F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

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☒ Further documents are listed in the continuation of Box C.

X See patent family annex.

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16 May 2007

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INTERNATIONAL SEARCH REPORT

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